

BIO-, MAGNETO- AND EVENT-STRATIGRAPHY ACROSS THE K/T
BOUNDARY

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Determining the time and the time structure of rare events in geology can be accomplished by applying three different and independent stratigraphic methods: Bio-stratigraphy, magneto-stratigraphy and event-stratigraphy. The optimal time resolution of the two former methods is about 1000 years, while by means of event-stratigraphy a resolution of approximately one year can be achieved (1).

For biostratigraphy across the K/T boundary micro- and nannofossils have been found best suited. The biologic turnover manifested by the disappearance of the Late Cretaceous micro-fauna (large planktonic foraminifera) and nannoflora and the evolution from small surviving species in the lowermost Danian has been known for a long time and has been found to indicate the K/T event at preserved K/T boundary sites all over the globe. Since paleomagnetism is determined by forces within the core of the earth, the change of magnetic polarity is worldwide and synchronous. Taking the K/T boundary as an example, it can be shown that its relative position within Chron 29R is the same at each boundary site independent of the thickness of sediments (2).

The K/T event, 66.7 m. years ago, has left its distinct fingerprints mainly in deep sea sediments of that age. The qualitative and quantitative analyses of minerals and trace elements across the K/T boundary show anomalies on a millimeter scale and permit conclusions regarding the time structure of the K/T event itself.

The results of our analyses find a most consistent explanation by the assumption of an extraterrestrial impact. The main portion of the material rain from the atmosphere ("fall-out") evidently was deposited within a short time.

The long-time components consist of the finest portion of the material rain from the atmosphere and the transported and redeposited fall-out ("redemption"). The cretaceous hemipelagic sediments contain about 70 % of biogenic calcium carbonate, and its $\delta^{13}\text{C}$ values indicate a microfauna living in warm surface waters. After the K/T event the CaCO_3 contents are diluted down to only 20 % and the $\delta^{13}\text{C}$ decreases to values corresponding to those of bottom waters (Fig.1). The phenomena in these sediments are direct consequences of the K/T event ("post event sequence").

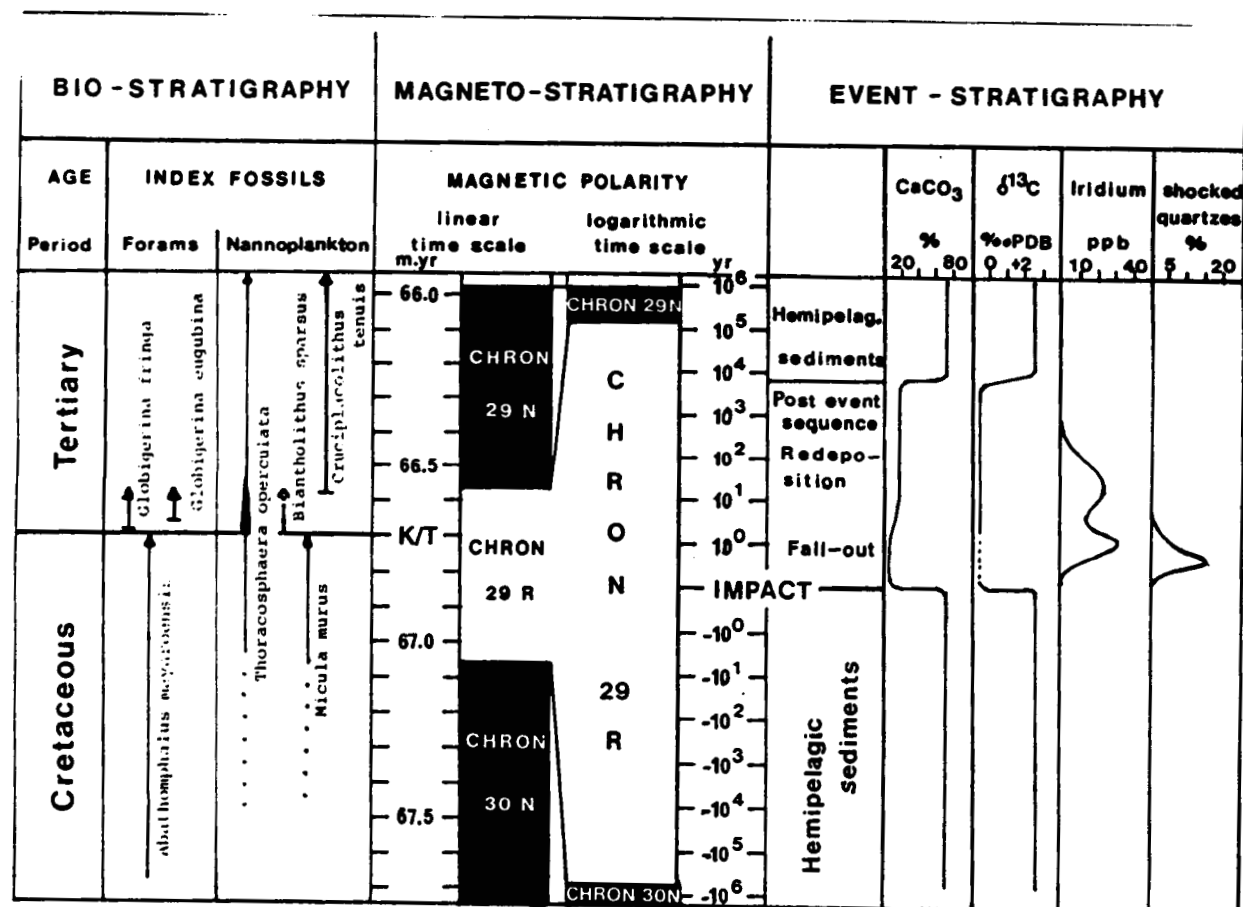


Fig.1
Characteristic features of hemipelagic sediments across the K/T boundary (Marine sediments from a paleodepth of about 1500 meters). Contents of Iridium and shocked quartzes are given in ppb and % respectively of decalcified samples.

References

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